this source of air supply leaves much to be desired on the score of quality. Much street dust may enter the cold air box and be distributed throughout the house. And few realize the parching quality of the air in furnace heated houses. I have found the air in a house heated by a good furnace in moderately freezing winter weather in Massachusetts with a relative humidity as low as 16 per cent. This, too, was with the water reservoir of the furnace well filled. Such air is far dryer than that of an oasis of the Sahara in the driest season of the year and it irritates the skin and mucous membrane and carries off moisture so rapidly in insensible perspiration as to make it necessary to maintain the room temperature at a point several degrees higher than would otherwise be demanded.

Furnace heating may be made to furnish much better air for breathing by straining the air, either by means of a thin layer of cotton batting at the entrance of the cold air box or by a layer of the silk-like glass fiber, used for jacketing steam pipes and so on, under each register. The humidity may be considerably increased by supplying boiling water to the evaporating reservoir in the furnace. In single rooms it may be raised by keeping a large coarse towel, frequently wrung out, hung from any convenient support immediately over the register. Where there is a combination of steam and furnace heating, the hot air may be moistened to any desired extent by letting a very minute steam jet enter the heated air inside the outer jacket of the furnace.

Whatever the nature of the heating apparatus employed, the householder of inquiring mind will find a good deal of food for reflection in the results obtained by burning touch-paper just over the registers or radiators which serve as the source of heat and watching the distribution of the heated air and by measuring the relative humidity of the air in some living rooms in cold weather, by means of a sling psychrometer. The values corresponding to the readings of the wet bulb and dry bulb thermometer can be obtained by inspection of the "Psychrometrical Tables" published by the U. S. Department of Agriculture, Weather Bureau.

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ELEMENTARY TEXT-BOOKS IN CHEMISTRY

TO THE EDITOR OF SCIENCE: Professor Miller in his address given at Indianapolis and published in No. 870 of SCIENCE criticizes in some important particulars the current elementary text-books in chemistry. Personally I would have been better pleased with the excellent and timely address if he had said "many text-books," or "most text-books," instead of "our text-books." It should also be said that an elementary book ought rather to be conservative than radical, as long as the conservative position has a considerable following among leading chemists.

The particular criticisms offered by Professor Miller suggest the general subject and lead me to speak of one or two others, which I confess do not apply to all elementary texts. Passing by criticisms that are often made—as that many books are too learned and heavy in style, that they make too much of chemical theory and do not show respect enough for chemical fact, etc.—I want to say a word concerning the immense field that the usual book presents to the high school student, to be completed in one year. I do not refer to the size of the book but the amount of matter. Some of the smaller books sin worst in this regard, being little more than a synopsis of a good college book. I know how much can be said in favor of a complete view of an important subject of study, and how much about the vital character of any particular suggested omission, but there is one sort of reduction that might easily be secured. This large field has grown of recent years partly by annexing outlying territory that was formerly regarded as belonging to other subjects of study. Many elementary books are written fully in the spirit of a sentence which I quote from a recent address on chemistry: "Physics, geology, engineering, physiology, botany, zoology and

biology are subdivisions of the broader science of chemistry." Should it not be possible to find a core of this work which is essential chemistry and teach that?

The physics people have met the challenge concerning boundaries and disputed territory courageously. It is not long since I heard a university professor begin a lecture on physics somewhat in this way: "Physics is the science of matter and energy. This field is so large that it is customary at present to break off the physics of the molecule and its reactions and call it chemistry. Also to put to one side the physics of the heavenly bodies and call this part astronomy," etc. So these two subjects, physics and chemistry, have been mutually devouring each other, like two Kilkenny cats, lo these many years. It seems to have been good for them, however, for both have grown to be lusty fellows. The only difficulty seems to be to determine which is which. Suppose we give up trying, call the amalgamated science what you like, and frankly make a two-years course in this science, with the topics arranged in logical order, as an elementary book for high schools. This would dispose of the not very important but still much discussed question whether chemistry should come in the eleventh or the twelfth year, as well as the far more important matter of extensive duplication. At first sight it might seem desirable to repeat a large amount of physics in the chemistry classes, especially as this part is in general very important, but a moment's thought will convince any one—not already convinced by experience—that this is not likely to be true. The work presses; the class will meet these subjects elsewhere; nobody is responsible for a full presentation of them; and so the few ideas most essential to further progress are made to suffice. There is no one to apply the excellent homestead law—one must not only stake out a field but occupy and do some work upon it.

If a two-years' unitary course in physical science can not be secured, some competent authority—say a joint committee of the chemical and physical societies of America—might be asked to say what shall be taught as chemistry and what as physics. For instance, where shall the modern doctrine of solutions be taught? How much of combustion, of electrolysis, of the action of a primary battery, is chemistry and how much physics?

E. A. STRONG

SCIENTIFIC BOOKS

Physical Optics. By ROBERT W. WOOD, LL.D., Professor of Experimental Physics in Johns Hopkins University. Second Edition. New York, The Macmillan Company. 1911. Pp. xvi + 705. Price $5.25 net.

To those who are acquainted with the earlier edition of Wood's "Physical Optics" it will be high and just praise of the second edition merely to say that it is vastly superior to the first. The new material added to the former discussion—roughly, fifty per cent.—illustrates the tremendous recent development of physical optics; and the manner in which all this work is described continues to illustrate the extraordinary clarity and precision with which intricate matters may be set forth, in a non-mathematical way, by a man who really and profoundly understands his subject.

Of the various additions and improvements, perhaps the following will serve to characterize the whole:

The first three chapters have not been much altered, although they do contain some new material, such as the work of Galitzin and Wilip on Döppler's principle, Pfund's mercury arc, etc.

A very characteristic addition finds place in the fourth chapter, the one dealing with refraction, where a series of photographs taken with a lens immersed in water—a "fish-eye camera"—has been inserted. These give a concreteness and directness to the treatment of the critical angle which could hardly be obtained in any other manner.

Chapter V., on dispersion, shows few changes, but is enriched by a plate showing Julius's remarkable series of photographs of the "D" lines, under various physical circumstances.

The value of the chapter on diffraction is